

REMARKS

[0005] Applicant respectfully requests reconsideration and allowance of all of the claims of the application. The status of the claims is as follows:

- Claims 1-12, 14 & 17-24 are currently pending
- Claims 2 and 5 are canceled herein
- Claims 1, 3, 4, 6, 12, 19 and 24 are amended herein
- New claims 25-27 are added herein

[0006] Support for the amendments to 1, 3, 4, 6, 12, 19 and 24 is provided by former claims 2 and 5, and is found in the specification at least at paragraph [0020] and the document incorporated by reference in paragraph [0020].

[0007] Furthermore, new claims 25-27 are fully supported by the Application, and therefore do not constitute new matter. Support for these new claims is also found in the specification at least at paragraph [0020] and the document incorporated by reference in paragraph [0020]. New claims 25-27 are asserted allowable over the cited documents of record at least because the cited documents of record have not been shown to disclose, teach, or suggest each element of claims 25-27.

Cited Documents

[0008] The following documents have been applied to reject one or more claims of the Application:

- Dussud: Dussud, U.S. Patent No. 6,502,111
- [0007]: Paragraph [0007] of the Background of the Specification

Claims 1-12, 14 & 17-24 Are Non-Obvious Over Dussud in view of [0007]

[0009] Claims 1-12, 14 & 17-24 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Dussud in view of [0007]. Applicant respectfully traverses the rejection. Nevertheless, solely for the purpose of expediting prosecution, Applicant amends independent claims 1, 12, and 19 to highlight distinctions between the claims and the cited documents. Furthermore, claims 2 and 5 are canceled herein without prejudice or disclaimer.

Independent Claim 1

[0010] In light of the amendments presented herein, and the above-referenced discussion with the Examiner, Applicant submits that the rejection of independent claim 1 is moot. Applicant understood the Examiner to tentatively concur with Applicant's position that the cited documents do not teach or suggest at least, "a plurality of cards that are associated with objects allocated from within a memory heap."

[0011] Claim 1, recites in part, as amended, "identify[ing] a plurality of memory locations that have been accessed since a last ephemeral garbage collection process, each memory location corresponding to one of a plurality of cards that are associated with objects allocated from within a memory heap, each of the plurality of cards being associated with a card table, wherein the card table identifies one or more of the plurality of cards with objects that have been accessed." The Office cites Dussud, c. 5, l. 42 to c. 6, l. 44; Fig. 1, elements 34 and 36a-36i; and c. 9, ll. 3-9 as teaching this element prior to the amendment. (Office Action, page 3)

[0012] During the interview, Applicant's attorney understood the Examiner to preliminarily concur that Dussud in combination with [0007] would not render claim 1 as amended obvious at least because in Dussud the write-watch mechanism is watching objects, whereas in the claim the cards are being watched. Additionally, the claim, as amended, highlights that there is not a one-to-one correspondence of cards to objects. There are fewer cards than objects, making the overhead of getting pages modified for the cards efficient in implementation.

[0013] The Office Action states the following (Action, pp. 4-5):

At the time of the invention it would have been obvious to a person of ordinary skill in the art to apply AAPA's card table/bundle garbage collection process, a known technique, to Dussud's concurrent garbage collection, a known system ready for improvement, such that the combined garbage collection system would, mark, during the ephemeral garbage collection process, two or more of the plurality of bundles identified in the bundle table of AAPA using Dussud's list, so as to yield the predictable results of improving the efficiency of ephemeral garbage collection as well helping minimize the dependency of ephemeral garbage collection on heap size.

[0014] As discussed during the interview, Applicant traverses the Office's finding of obviousness at least on the basis that the proposed combination would be non-operable for its intended purpose. Specifically, marking during the ephemeral garbage collection process, two or more of the plurality of bundles identified in the bundle table of paragraph [0007] using the list of Dussud would be excessively expensive because watching the objects themselves as in Dussud would entail too many changes, the list of modified pages would be prohibitively large. The object granularity is too low.

[0015] Additionally, claim 1, recites in part, as amended, “the list: ... comprises a bitmap and each bit within the bitmap corresponds to one of the plurality of cards, modification of the bitmap occurring when a corresponding bit is set at the time that the card is trimmed to disk.” Applicant respectfully asserts that this feature is neither disclosed nor taught in Dussud or [0007].

[0016] Accordingly, at least because the combination of Dussud and [0007] does not teach or suggest all of the elements and features of this claim, Applicant respectfully requests that the rejection of this claim be withdrawn.

Independent Claims 12 and 19

[0017] In light of the amendments presented herein, and the above-referenced discussion with the Examiner, Applicant submits that the rejection of independent claims 12 and 19 is moot. Claims 12 and 19, as amended, each recite at least one element corresponding to those discussed during the interview and addressed above regarding claim 1.

[0018] For Example, claim 12, recites in part, as amended “specifying a range of card table memory to watch during program execution by calling a write-watch mechanism that performs tracking of the access to the card table memory and maintains a write-watch list that identifies cards accessed within the card table memory since a garbage collection process was last performed, , each card being associated with and updated upon access to objects allocated within a memory heap, the memory heap being divided into the plurality of cards with each card being grouped into one of a plurality of

bundles, wherein one of the plurality of bundles corresponds to a subset of that plurality of cards that are tracked using a page of card table memory.”

[0019] Additionally, claim 19, recites in part, as amended “each card being associated with a group of the plurality of objects, wherein upon execution of the plurality of instructions by the processor, the system being configured to: request a list from a tracking mechanism, the list identifying memory locations that have been written into since a last garbage collection cycle, each memory location corresponding to one of the plurality of cards associated with a card table, wherein the card table identifies one or more cards that have been accessed, the card table and cards being marked to identify the one or more of the plurality of cards with the group of objects that have been accessed, during a first program execution process exclusive of an ephemeral garbage collection process.”

[0020] Accordingly, at least because the combination of Dussud and [0007] does not teach or suggest all of the elements and features of these claims, Applicant respectfully requests that the rejection of these claims be withdrawn.

Dependent Claims 3, 4, 6-12, 14, 17-24, and 25-27

[0021] Claims 3, 4, 6-12, 14, 17-24, and 25-27 ultimately depend from one of independent claims 1, 12, or 19. As discussed above, claims 1, 12, and 19 are asserted allowable over the cited documents. Therefore, claims 3, 4, 6-12, 14, 17-24, and 25-27 are also asserted allowable over the cited documents of record for at least their dependency from an allowable base claim. These claims may also be allowable for the additional features that each recites.

[0022] For example, new claim 26 recites "determining whether the call to the write-watch mechanism resets a write-watch state by inquiring which cards have changed without being considered as having asked and thereby resetting the state, and in an event the state is to be reset, placing a separate reset call to reset the range of card table memory without reporting whether the cards in the range have been marked." These features are not found in the cited documents. For at least this additional reason, claim 26 is asserted allowable over the cited documents.

[0023] New claim 27 is asserted allowable over the cited documents for at least similar reasons as claim 26, discussed above.

Conclusion

[0024] For at least the foregoing reasons, all pending claims are asserted in condition for allowance. Applicant respectfully requests reconsideration and prompt issuance of the application.

[0025] If any issues remain that would prevent allowance of this application, **Applicant requests that the Examiner contact the undersigned representative before issuing a subsequent Action.**

Respectfully Submitted,

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Representatives for Applicant

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